

**REMARKS/ARGUMENTS**

Favorable reconsideration of the present application in light of the above amendment and in light of the following discussion is respectfully requested.

Claims 15 and 18 are pending in the present application. Claim 19 has been canceled without prejudice, Claims 15 and 18 have been amended by the present amendment.

In the outstanding Office Action, Claims 15, 18 and 19 were rejected under 35 U.S.C. § 112, first paragraph; Claims 15 and 18 were rejected under 35 U.S.C. § 102(b) as anticipated by Vives; Claim 19 was rejected under 35 U.S.C. § 103(a) as unpatentable over Vives; and Claims 15, 18 and 19 were rejected under 35 U.S.C. § 103(a) as unpatentable over Radjai et al. (herein "Radjai") in view of Vives.

With regard to the rejection of Claims 15, 18 and 19 under 35 U.S.C. § 112, first paragraph, Claim 15 has been amended to remove "closed," which was indicated by the Examiner as not enabling. Accordingly, it is respectfully requested this rejection be withdrawn.

Claim 15 has been amended to include the subject matter of Claim 19, and Claim 19 has been canceled. Also, Claims 15 and 18 have been amended for clarification. Further, amended Claims 15 and 18 find support at page 7, line 17 to, page 11, line 10 and Figure 1. No new matter is added thereby.

Claims 15 and 18 stand rejected under 35 U.S.C. § 102(b) as anticipated by Vives. This rejection is respectfully traversed.

Amended Claim 15 is directed to a method for producing a refined microstructure of a metallic material that includes solidifying a molten metallic material and applying an electric current and a magnetic field simultaneously to the solidifying metallic material to crush solid crystal particles of the solidifying metallic material into small pieces such that the small pieces are shifted to a periphery of a cylindrical tube or container to yield the refined

microstructure of the metallic material concentrated in the periphery of the cylindrical tube or container. The cylindrical tube or container is disposed such that an axial direction thereof is orthogonal to the magnetic field.

By providing such a method, it is possible to refine a microstructure of a metallic material and move solid metal particles to a prescribed location (see the specification, page 10, lines 15-20).

Vives describes a study of effects of forced vibrations produced by two different electromagnetic force patterns during freezing of aluminum alloys, where simultaneous application of an oscillatory electric field and a steady magnetic field is used as electromagnetic force patterns (see Vives, column 3, line 60 to, column 4, line 18). Vives also states that in the presence of well-developed cavitation situations, a very fine and homogeneous structure has been observed throughout the ingot (see the abstract of Vives). Vives appears to achieve *uniform distribution* of a refined microstructure throughout the ingot, however, Vives does not teach or suggest that "... applying an electric current and a magnetic field simultaneously to the solidifying metallic material to crush solid crystal particles of the solidifying metallic material into small pieces such that the small pieces are *shifted* to a periphery of a cylindrical tube or container to yield said refined microstructure of the metallic material *concentrated in the periphery* of the cylindrical tube or container" as recited in amended Claim 15.

Applicants respectfully submit that the "shifted" or "concentrated" refers to movement of the metallic material that is due to the effect of pinch power generated by induction phenomenon that is different from a refinement of the metallic material generated due to an effect of oscillatory electric and magnetic field. Applicants further note that the method as recited in amended Claim 15 shifts small pieces of crystals to a periphery of a cylindrical tube or container to limit the crystals to being at the periphery so that the

concentrated crystals can be separated easily from the cylindrical tube or container by the subsequent process. Further, Applicants respectfully submit that the claimed movement of the small pieces does not *necessarily* flow from the teachings of Vives (see M.P.E.P. § 2112).

Accordingly, it is respectfully submitted that independent Claims 15 and 18 define over Vives.

The rejection of Claim 19 under 35 U.S.C. § 103(a) as unpatentable over Vives is now moot in view of canceling of the claim.

Claims 15 and 18 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Radjai and Vives. This rejection is respectfully traversed.

Radjai discloses a study of an effect of electromagnetic vibrations induced by alternating electric and stationary magnetic fields on a solidified structure of Al-Si alloys (see Radjai, lines 1-2). In the study of Radjai, Radjai found that application of any of the two fields alone had no significant effect on a microstructure of the alloys, and a significant effect was observed when the two fields were applied simultaneously (see Radjai, lines 10-11). In addition, Radjai found silicon particles with a reduction in size by vibrations *at temperature higher than a liquidus* and agglomerated and repelled to an outer surface, and determined that the cavitation phenomenon was responsible for crushing of silicon particles (see Radjai, lines 14-15).

However, Radjai does not teach or suggest "... applying an electric current and a magnetic field simultaneously to the *solidifying* metallic material to crush solid crystal particles of the solidifying metallic material into small pieces such that the small pieces are *shifted* to a periphery of a cylindrical tube or container to yield said refined microstructure of the metallic material *concentrated in the periphery* of the cylindrical tube or container" as recited in amended Claim 15.

Further, Applicants respectfully submit that the claimed movement of the small pieces does not *necessarily* flow from the teachings of Radjai (see M.P.E.P. § 2112).

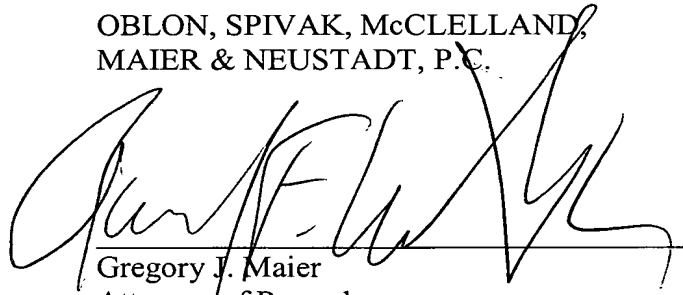
Because neither Vives nor Radjai discloses the claimed movement of the small pieces, even the combined teachings of these cited references do not render the method recited in Claim 15 obvious.

Accordingly, it is respectfully requested this rejection be withdrawn.

In view of the above discussion and the present amendment, Applicants respectfully submit that the present application is believed to be in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

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